

Structural Technology for Future Large Cryogenic Apertures

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This paper will discuss technological requirements and capabilities for future large aperture cryogenic telescope instruments. Recently developed design rules for large space structures allow complex system trades to be distilled into simple design scaling laws. These scaling laws directly compare the benefits of various structural technologies. For example, the benefit of deployable structure technologies can be directly compared with the benefit of advanced materials and active control methods. Specific examples will be included for a 10-meter class IR telescope suitable for the SAFIR mission. One trade that will be illustrated is between the passive stability of the deployed instrument and active adjustment of the optical elements and/or wavefront control. An additional trade is between the extremely low damping of cryogenic structures and the overall stiffness of the deployed structure. This leads to a quantitative measure of the benefit between deployable depth, passive damping treatments, and possibly active vibration control.